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Livelihood Strategies after the 2004 Indian Ocean Tsunami in Banda Aceh, Indonesia

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Abstract

The 2004 Indian Ocean Tsunami disaster which affected Indonesia, particularly the Aceh Province, left devastating impacts to the people and their livelihoods. The tsunami waves wiped out 800 kilometres of coastline and 3,000 hectares of land, killing many and caused permanent land losses including aquaculture ponds. This resulted in disruption of the households' livelihood that relies on aquaculture activities as well as on the natural resources such as the mangroves found in the aquaculture farms along the coastal areas. This study aims to understand the impacts of the 2004 Indian Ocean Tsunami disaster on the households' livelihood, and the interventions from the government and non-government organisations (NGOs) to help rebuild household's livelihood. The study also identifies the livelihood strategies households had taken to adapt to their current livelihood. Information from 77 households was collected for analysis. Quantitative and qualitative data were collected between September 2015 to March 2017 through questionnaire surveys, semi-structured interviews, observations, and group discussion to understand the livelihood recovery experience of disaster-affected households. Household who previously were involved in aquaculture farming, traditional cigarette making and fishing had taken up livelihood strategies such as agricultural intensification and livelihood diversification to attain income security and better well-being of education opportunities for their children and better housing condition to live and conduct their home-based businesses.

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1. Introduction

The 2004 Indian Ocean Tsunami disaster affected many countries among which the highest devastation was found in Aceh Province in Indonesia; killing 167,052 people, affecting another 590,684 individuals with estimated total damage of USD 4.5 billion [1]. The significant destruction totalled up to about 97% of the Province's GDP [2]. Records from [3] and [4] showed 669 government buildings, 517 health facilities, 3,000 kilometres of roads, 14 seaports, 11 airports and 120 bridges and other facilities such as education and telecommunication were badly affected. 78% of the private sector also suffered severely from the disaster. About 139,200 homes were totally destroyed or severely damaged, and 104,500 SMEs were wiped out by the tsunami. Farmers and fishers were unable to work as 73,869 hectares (ha) of agricultural land were destroyed, 13,828 of fishing boats were lost, 27,593 ha of aquaculture ponds disappeared, 16,775 ha of coastal forest and mangroves, and 29,175 ha of reefs were lost [5]. Among those affected sectors, agricultural, particularly fisheries experienced the worst effects [6]. About half of the total fishermen population were killed; 55,000 fishermen and aquaculture workers, and 14,000 more were reported missing [7]. This has severely affected and paralysed the livelihood activities of those living along the coastal area who were relying on the natural resources from the sea and mangroves. The immense destruction had decreased the ability of households to continue with their previous livelihood causing them to diversify and change their livelihood strategies through their own efforts, or the livelihood assistance received [8] [9].

In Aceh, the livelihood restoration was given secondary consideration as attention and funding were given more towards housing reconstruction [10]. A survey conducted to livelihood beneficiaries found that livelihood restoration programs implemented by the government and the NGOs were rated poorly [11]. Most of the aid agencies' funds were provided mainly for housing reconstruction and did not have enough for livelihood intervention programs [12]. In the aftermath of a disaster, aid response is necessary to assist the affected people in securing their livelihood [9]. Although there are plenty of studies on livelihood, little research has been made on livelihood changes in tsunami-stricken areas. Tsunami and earthquake disaster has the characteristics of unexpectedness and massive devastation, which was different from many other types of natural disasters. Hence, it is necessary to continually increase exploration to improve the knowledge of livelihood changes tsunami-stricken areas of Indonesia. This study aims to understand the impacts of the 2004 Indian Ocean Tsunami disaster on the household's livelihood, and the interventions from the government and non-government organisations (NGOs) to help rebuild household's livelihood. The study also identifies the livelihood strategies households had taken to achieve their current livelihood. The paper is structured as follows. In Section 2, the study site situation of before and immediately after the disaster event is introduced, and basic information on the methodology of the study is provided. In Section 3, disaster impacts on the household's livelihood are explored, followed by the livelihood interventions from the government and the NGOs in Section 4. Adaptive strategies taken by households are Section 5. Discussion in Section 6. Finally, Section 7 is concluded with the summary of the paper with some remarks.

2. Study Area and Methods

Survey was conducted in a village called Pande (Fig. 1) in Banda Aceh, Indonesia, which was heavily devastated by the 2004 Indian Ocean Tsunami disaster leaving only 30% of the total population. The location of the village is close to the tsunami prone zone where Indo-Australian and Euroasia plates collide with each other. The disaster had altered the land features which drastically changed the aquaculture pond land size (Fig. 2) affecting the households' livelihood. Pande has clay soil with flat topography, is 257 ha in size; 57 ha for settlements, facilities and infrastructures, and 200 ha is wetlands comprising of aquaculture pond and mangroves. There are 4 hamlets with 251 households making Pande's population density at 85 persons per km². There are 101 poor households, of which 29 are extremely poor households (*fakir*) earning IDR (Indonesia Rupiah) 450,000 (USD (US Dollar) 33) monthly, and 73 are poor households (*miskin*) earning between IDR 450,000 to IDR 900,000 (USD 67) monthly [13].

The research is a cross-sectional study relying on quantitative and qualitative data through questionnaire surveys, semi-structured interviews, observations, and group discussion were conducted to understand the livelihood recovery experience of disaster-affected households. From the 100 household's heads selected using convenience sampling, 77 valid responses were obtained. In order to collect more information on their livelihoods and better understand the respondents' various actions, a total of 15 respondents were interviewed through semi-structured interviews, and 1 informal group discussion of 5 women were conducted. The interviewees were asked questions covering (1) personal and household information, (2) household livelihood changes and (3) strategies taken to the tsunami disaster. The

informal group discussion and observation on the livelihood of the villagers completed and improved the reliability of the information gathered. Secondary data related to livelihoods such as those from the Gampong Pande Village Medium Term Development Plan, journals, and reports from the international and local organisation, statistical data as well as books from relevant sources were also obtained. Fieldworks were carried out between September 2015 and March 2017 in Pande. Quantitative and qualitative data were later processed for descriptive analysis while the interview results were recorded through written notes and audio recordings which were coded and developed a theme and were summarised.

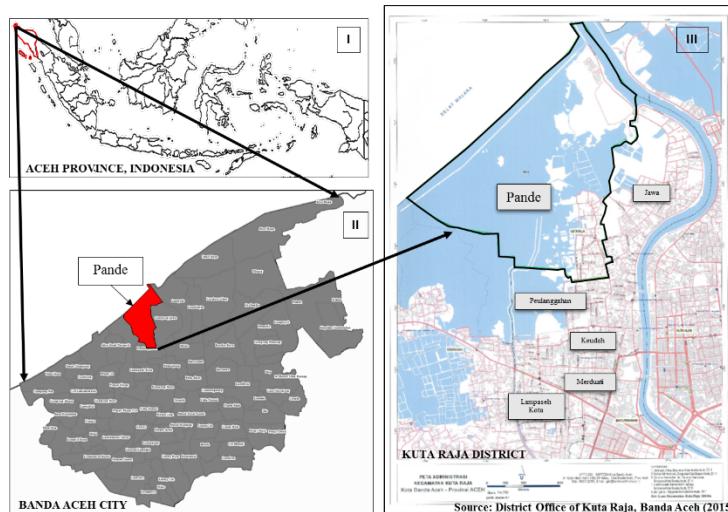


Fig. 1. Location of study site, Gampong Pande in Banda Aceh, Indonesia



Fig. 2. Gampong Pande's change using satellite imagery of the before and after the 2004 Indian Ocean Tsunami Disaster (Source: JICA and Development Planning Agency of Banda Aceh City, 2016)

3. Pande's Livelihood and Impacts of the 2004 Indian Ocean Tsunami Disaster

3.1. Pre-tsunami condition

The pre-tsunami population of Pande was 1,199 people (689 male, 510 female) [14]. The household monthly income was in the range of IDR 1,000,001 to IDR 3,000,000 (USD 115 – USD 345) [15]. The number of people living under the poverty line in Aceh in 2004 was at 28%, which was higher than the national's, 17%. People living under the poverty line increased to 33% immediately after the disaster due to loss of jobs. The number decreased to 27% in 2006 due to the reconstruction activities. As of 2016, the population living under the poverty line is at 17%. At the time of the disaster, the majority of Pande's households was engaged in small-scale traditional aquaculture farming,

traditional cigarette making and fishing as their primary livelihood activity. These households were low-educated, low-skilled but nonetheless own aquaculture ponds land. The minority of non-farming employment consisted of construction labourers, small businesses, and government sector employee.

3.2. Immediately after tsunami condition

The tsunami killed 945 people (79%) of the population, leaving 254 survivors (175 male, 81 female). The disaster inundated most aquaculture ponds that affected the population who depended heavily on the natural resources. The aquaculture pond land in Pande suffered 91% of loss as land size was reduced from 167 ha to only 14 ha. On the other hand, the mangrove quantity in Pande was 23 ha pre-tsunami and was reduced to 15 ha post-disaster [16]. Surviving households stayed in the evacuation centre and received various types of aid. During the relief period, few fishing and aquaculture households continued with their previous activities or took up CFW works. The average monthly income during the relief phase was USD 297 with 93% came from CFW [17]. They went fishing in the sea by borrowing or sharing fishing gears or looking for fish, crab and shrimp in the remaining ponds, canals and mangrove area.

3.3. Current condition

As of August 2016, the total population of Pande is 860 people; 450 male and 410 females. Households' income earning is at IDR 1,515,065 (USD 114) [18] higher than Aceh's poverty line of IDR 523,444 (USD 39) as of September 2016. However, the income of the household is lesser than the pre-tsunami income as well as below the average monthly income in Indonesia, IDR 1,918,693 (USD 144) [19]. Almost half of the household reported that their financial condition experienced no change compared to 12 years ago. After the rehabilitation and restoration works of the aquaculture ponds, only 18 ha of the aquaculture ponds is productive [8]. The mangrove replantation works resulted in 48 ha of mangrove in Pande as of 2013 [20]. After 12 years since the disaster, the majority of the households in Pande is now involved in the non-agricultural livelihood activities. Only 3.6% of Pande's total working population are unemployed. Our survey also found that 88% households renovated their house to create space for their home business; selling snacks, sewing area, storage for business materials as well as adding other personal spaces. A total of 63% households spent more than IDR 10,000,001 (USD 754) for the renovations indicating that household prioritises their livelihood. Households also mentioned that education for their children was important and was recognised as one of the motivations which encouraged households to improve their livelihood.

4. Livelihood Interventions by the Government and NGOs After the Disaster

4.1. Policies to Provide Housing

Following the tsunami, Pande households were evacuated temporarily to the evacuation centre, while waiting for the reconstruction of their new house. The Government of Indonesia issued Disaster Mitigation in Coastal Areas and Small Islands (Government Regulation No. 64/2010), and Housing and Residential Areas Law (No.1/2011) through the National Development Planning Agency and Ministry of Public Works, granted all entitled disaster-affected households to receive either reconstruction or rehabilitation assistance [12]. Households who completely lost their house were given a 36m² standard housing unit for free regardless of their previous housing status, while households with heavy or middle or little damaged were provided funds worth IDR 15,000,000 (USD 1728), IDR 10,000,000 (USD 1152) and IDR 5,000,000 (USD 576) respectively to repair their houses. Other policies that also supported better housing reconstruction and a safer anti-seismic construction standard house were established through national level policy, UU No. 24 Th. 2007 on Disaster Handling and PP No. 21 Th. 2008 on Implementation of Disaster Handling. The policy also incorporated land tenure security to facilitate economic recovery [21]. The housing reconstruction program was simultaneously linked with employment, human resource as well as economic and business development.

4.2. Establishments Supporting Livelihoods

International Labour Organisation together with local, national, and international NGOs, as well as the Ministry

of National Manpower and local governments, offered support and technical assistance by establishing Employment Service for the People of Aceh Province to maximise the jobs and livelihood opportunities for the Acehnese during the recovery period [22]. The centres provided training in English language skills, computer skills, debris clearing works, garment-making, weaving and embroidery, business set-up, fish processing and construction work as well as job placement services [22]. Some NGOs also generated jobs via cash-for-work (CFW), small-scale fisheries activities, rehabilitation of aquaculture ponds and livelihood schemes for women and youth such as snack making and handicrafts [23]. Most Pande's households were unable to return to their previous livelihood and took up CFW work to cope in the short-term. The CFW program provided temporary income paying about IDR 50,000 (USD 5) that lasted about 2 to 3 months. Tasks included removing and burying corpses, clearing debris, cleaning houses and public facilities such as roads and drains as well as constructing temporary shelters. After a year, some households were able to return to their previous work due to the construction of the seawall which enabled some ponds to be restored. However, the income level did not return to the pre-disaster level.

4.3. Microcredit Program

During the reconstruction period, there were several microcredit programs provided to the women in Pande to start business such as selling snacks or tailoring to increase their independence and resilience. Training and livelihood assets were given as a start-up business support in the form of machines, tools, equipment and raw materials as well as cash grants. As of 2016, the existing services in Pande such as Fisherman Credit Cooperative, Independent Savings and Loan Cooperative and Women Household Head's Productive Economy Cooperative were found to have either closed down or not going well. For instance, the women's cooperatives had problems which led to some of the members could not sustain their business due to various reasons such as dishonesty among the credit members, inability to pay on time, or did not return the payment overdue. There is also the informal credit, *arisan* (local rotating savings and credit co-op without interest) group in Pande which only converge during certain festivities such as Eid Adha, *Korban Arisan* where people pool their money to buy a goat or a cow for the event.

4.4. Policies to Conserve Nature and Environment

In the Banda Aceh Green Development Plan for RTRW Kota Banda Aceh 2009-2029 by the city government, Pande is included in the recreational infrastructure coastal area development to transform Pande into green open space for natural heritage tourism and waterfront city that serves the economic, socio-cultural and natural/environmental sustainability. Apart from being a natural conservation area that acts as a buffer zone, Pande area is also being developed into an eco-tourism site, coastal tourism, water tourism, fishing, camping and seafood culinary spots. At the same time, there is also the conversion of the young mangrove forests into aquaculture ponds which raised concerns due to the usage of energy, and chemical inputs which are susceptible to contaminate the soil and its surroundings.

4.5. Policies to Protect Historical Treasures

As one of the historical places in Banda Aceh, efforts were made by local NGOs to preserve and care for the ancient tombstones for historical conservation purposes which also attracts tourists to Pande. The Department of Culture and Tourism Banda Aceh has assigned Pande's residents to maintain and clean the ancient tombstones as well as safeguarding the location of the artefacts. The maintenance of the ancient tombstones works provided income to the local people. On the other hand, artefacts and many other ancient tombstones were also found in the rehabilitated ponds which were declared off-limit and decreased the number of functional ponds for aquaculture farming.

5. Adaptive Strategies Undertaken by Pande's Households

Towards the end of 2009, as most of the international NGOs gradually closed down and exited Aceh, Pande households began to seek for long term income generating activities. The current condition of Pande's households' livelihood strategies can be categorised into the three classifications of [24] of agricultural intensification, livelihood diversification and migration.

5.1. Agricultural Intensification

- Fisheries institutions

The access to support and training for aquaculture households in Pande had improved with the establishment of the Aquaculture Livelihood Service Centre, Aceh Aquaculture Communication Centre, Brackish Water Aquaculture Centre, IPTEK Mina Business Clinic and a local Pande fish aquaculture group. These institutions established the application of marine and fishery technology to familiarise the know-how to the communities, empowered farmers economically, increased farmers' role and involvement in ensuring their livelihood sustainability, improved social capital through networking, knowledge generation and sharing. As a start-up, aquaculture farmers who lost everything were supplied with fish and shrimp seedlings, feed and fertiliser as well as technical guidance and advice on improving pond design and boosting production. Aquaculture farmers also received training of good pond management and technical assistance through their local network.

- Farming style and pond management

Aquaculture ponds in Pande are raised either intensively or naturally depending on the capital availability of the owner and also the functionality of the restored ponds. Intensive breeding incurs a higher cost as full-time labour is needed and the use of electrical machinery and equipment. On the other hand, natural breeding ponds are poor quality ponds which do not support the effective growth of the shrimp/fish. These ponds breed aquatic seedling naturally; with very less supervision and machinery to support the living environment. The owner either manages by himself or leases the 2 ha ponds for a term of 5 years at IDR 16,000,000 (USD 1,205) or IDR 3,500,000 (USD 264) per year. Leasing takes place as a trade-off for a lower but safer income which draws in lesser likelihood of income failure [25].

- Mangrove and aquaculture integration approach

Silvofishery mangrove planting is an integrated practice of aquaculture farming within the mangrove area in Pande to create a green belt zone which benefits the coastal communities in the long run [16]. Most Pande's aquaculture farmers applied polyculture farming involving crab and shrimp or crab and milkfish. These generate multiple types of produce. The crab's price is usually higher from December to June, and hence, farmers have to plan the breeding schedule to correspond with the market demand. The Village Budget Allocation (ADD) allocated about IDR 50,000,000 (USD 3,768) for Pande's mangrove management training which also incorporated pond-handling techniques to improve and increased harvest.

- Poultry and livestock rearing

Households were also engaged in poultry and livestock rearing, particularly ducks and goats respectively. Goats have higher market value especially during Muslim events like Eidul-Adha and Eidul-Fitri. Depending on the species, an adult goat is worth IDR 1,700,000 (USD 128) in the market during normal days and gets costlier; as high as IDR 5,000,000 (USD 377) during the festivities. The livestock livelihood program in Pande started with the distribution of young goats and ducks worth IDR 300,000,000 (USD 22,611) for a three-year period (from 2016 to 2019) to 50 households from the ADD. As for poultry, duck rearing is preferred over chicken owing to the Acehnese delicacy of salted duck egg. Another livelihood aid worth IDR 25,000,000 (USD 1,884) for 30 households also from the ADD will be released in 2017 for the purpose of providing extensive training on goat rearing and duck farming.

- Home-grown food supply

A home-grown vegetable program called Family Medicinal Plants Program, locally known as *Tanaman Obat Keluarga* (TOGA) started by international NGOs to meet Pande's household's daily food demand and food reserve while making use and beautifying the garden. The basic Acehnese ingredients to be planted are such as chillies, tomatoes, eggplant, and onion as well as herbs plants such as ginger, celery, mini star fruit, lemongrass, kale, aloe vera, galangal, green chiretta, *temulawak*, cumin, and turmeric that are traditionally used for medicinal purposes which can also be eaten. There were only a few households planting TOGA herbs due to the limited support for the seedlings as well as the low awareness of the program's benefits. In 2016, the ADD had allocated about IDR 50,000,000 (USD 3,768) for Pande to create TOGA awareness, acquire healthy seedling, and for cultivation training. TOGA is hoped to engage the women in replace of the traditional cigarette production.

5.2. Livelihood diversification

Some households in Pande ceased their aquaculture and fishing activities and diversified their livelihood by doing various types of activities. These activities were conducted full-time, part-time, or seasonally depending on the needs of the household.

- Government service

The number of households in Pande who worked in the government sector increased twice in 12 years due to the prospect of income stability. Civil servant, policemen, army, and soldier were among the government profession.

- Casual labourer

Many aquaculture households were conducting multiple livelihood activities that could secure them a monthly income. Households perform extra activities by working at construction sites or other's aquaculture farm or going to the sea afterwards for about 3 hours to look for fish.

- Transportation businesses

Some aquaculture households sold their pond to other farmers and used the money to venture into transportation businesses; purchasing *ojek* (motorcycle) or *becak* (rickshaw) to ferry villagers to places outside of the village.

- Small-scale home business

Some housewives took up activities such as online business through WhatsApp group (e.g. selling baby clothes, shawl, dresses, and *mukenah* (female praying garment)), sewing or making *kue* (traditional snacks/cakes) as equipment were given to assist them in their businesses. The training households received during the disaster period had helped some of the households to open tailoring services in Pande. Curtains, traditional wear, bags were among the goods produced.

- Home-made products

As of 2016, Pande had 7 home-made products consisting of cakes and snacks, handicrafts, furniture, herbal health drink and detergent which are sold in the market.

6. Discussion

The current livelihood activities in Pande are dominated by housewives and households working in the private sector. The number of aquaculture and fishing households were reduced drastically despite the rehabilitation and restoration efforts. For instance, the number of functional ponds was limited due to various reasons such as soil quality, salt water intrusion due to the low quality of restoration works, virus infections on the shrimps raised and artefacts discoveries within the aquaculture pond. These demotivated some household to continue with aquaculture farming, which led to selling off their ponds to take up another livelihood. Additionally, the seasonal and unsteady income from aquaculture farming and fishing activities resulted in households opting for a more secure stable employment such as in the government or the private sector. 30% of the households preferred doing businesses that enabled them to earn higher and more regular than aquaculture farming or fishing.

Interventions have focused on the recovery of livelihood for the households. Significant input has been invested by both the government and the NGOs to assist the disaster-affected households to intensify and diversify to secure their livelihood. The housing support freed some cash for the households which otherwise needed for building material and labour works. This had helped the households to conduct income-generating activities, especially for the women, where they can work from their home to seek additional income for their household to support daily expenditure and children's school expenses. Furthermore, the small number of unemployment in Pande was due to the introduction of marketing strategies for the home-based products and job fairs offered by the local government.

The households in Pande took up two only out of the three strategies suggested by [24] namely agricultural intensification and livelihood diversification. Households did not engage migration to improve their livelihood as the village was already strategically located within the city area. The majority of Pande residents preferred to stay in their locality as they were already familiar, comfortable and developed an attachment to the area.

7. Conclusion

The research summarised the impacts 2004 Indian Ocean Tsunami disaster on the household's livelihood in Pande village, and the policies and institutions influence on household's livelihood. The disaster had swept across the land and transformed local livelihoods by changing the demography and the geological make-up as well as the land size upon which natural-based resource livelihoods such as aquaculture pond farming, traditional cigarette making and fishermen depend. Households took up trading activities, became fishmonger, or worked in the government sector or having a home-based business to help with the household's earnings. The strategies taken by household with the interventions from the government and NGOs resulted in achieving household's desired outcome in attaining income security and better well-being by earning and conducting business from home comfort and education opportunities for the children.

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